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D. Remarks

Rejection of Claims 1 and 4 Under 35 U.S.C. §102(e) based on U.S. Patent No. 6,077,764 (Sugiarto et al.).

5 The invention of claim 1 is directed to a method that includes varying a dopant supply rate for a doped insulating layer according to a variation in temperature of a substrate on which the doped insulating layer is formed. Varying the dopant supply rate includes increasing dopant supply rate as the substrate temperature increases.

10 As is well known, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference. Because the reference *Sugiarto et al.* does not show all elements of claim 1, this ground of rejection is traversed.

Sugiarto et al. teaches the depositions of a fluorosilicate glass (FSG) layer. However, such teachings do not show increasing a dopant supply rate as the temperature increases.
15 *Sugiarto et al.* teaches heating a wafer within a particular temperature range.¹ Once heated, this temperature is never described as being increased. Subsequently, a process gas is introduced into a processing chamber. Such a gas has certain constituents with flow rates within particular ranges.² However, such flow rates are never described as being increased, let alone increased in as a substrate temperature increases.

20 Still further, *Sugiarto et al.* clearly teaches away from increasing a dopant supply rate for a given range. As is clearly shown in FIG. 2C of *Sugiarto et al.* and described in the reference, increasing a dopant supply rate decreases film quality:

25 In addition, as SiF₄ flow increases... the quality of the film decreases (stability decreases as fluorine content increases).³

That is, *Sugiarto et al.* teaches away from an increasing dopant supply flow rate, and doing so has adverse consequences.

Thus, because the cited reference does not show all limitations of claim 1, and teaches

¹ See *Sugiarto et al.*, Col. 10, Lines 65-67.

² See *Sugiarto et al.*, Col. 10, Line 67 to Col. 11, Line 21.

³ *Sugiarto et al.*, Col. 12, Lines 38-44.

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away from such limitations, this ground of rejection is traversed.

Rejection of Claims 1-3, 5, 7 and 9-10 Under 35 U.S.C. §103(a), based on U.S. Patent No. 6,100,202 (Lin et al.) in view of Sugiarto et al.

5 As is well known, to establish a prima facie case of obviousness, a rejection must meet three basic criteria. First, there must be some suggestion or motivation to modify a reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference(s) must teach or suggest all claim limitations.

10 With respect to claim 1, to the extent that this ground for rejection relies on *Sugiarto et al.* to show increasing a dopant supply as a substrate temperature increases, the remarks set forth above for claim 1 are incorporated by reference herein. Namely, that such a limitation is not shown or suggested by the reference.

It is admitted that the other reference relied upon, *Lin et al.*, does not show increasing a dopant supply rate as a substrate temperature increases.⁴

15 Accordingly, a prima facie case of obviousness has not been established for claim 1, and this ground of rejection is traversed.

A prima facie case of obviousness has not been established for various claims depending from claim 1.

20 Dependent claim 3 recites different dopant supply rates for different time periods, where such time periods are of the same length. This limitation was not addressed by the rejection. Accordingly, a prima facie case of obviousness cannot have been established for this claim.

25 Dependent claim 9 recites that a dopant flow rate is varied over a first period of time and maintained constant for a second period of time. This limitation is not shown in or suggested by the combination of references. *Lin et al.* shows two different time periods (2 seconds and 180 seconds)⁵, with different dopant supply rates, but a dopant supply rate is maintained constant in both periods, and never varied.

As indicated in the remarks for claim 1, *Sugiarto et al.* shows no such variation. Thus, cannot show or suggest limitations of claim 9.

⁴ See the Office Action, dated 3/20/03, Page 4, last three lines.

⁵ See *Lin et al.*, Col. 15, Lines 18-31.

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Accordingly, because the combination of references does not show all limitations of claim 9, a prima facie case of obviousness has not been established for claim 9.

5 Rejection of Claim 8 Under 35 U.S.C. §103(a), based on *Lin et al.* in view of *Sugiarto et al.*, further in view of U.S. Patent No. 4,376,672 (*Wang et al.*)

To the extent that this ground of rejection relies on the combination of *Lin et al.* in view of *Sugiarto et al.*, the comments set forth above for claim 1 are incorporated by reference herein. Namely, that all the limitations of base claim 1 are not shown or suggested by the combination of references.

10

Rejection of Claims 11, 13-16 and 18-19 Under 35 U.S.C. §103(a), based on *Lin et al.* in view of U.S. Patent No. 6,521,546 (*Barnes et al.*) and *Wang et al.*

15 The invention of claim 11 is directed to a method that includes compensating for a temperature dependent gradient in a doped insulating film. The doped insulating film comprises silicon oxide with a phosphorous concentration greater than about 7% by weight. Such a compensating step includes varying a dopant supply rate as the doped insulating film is formed.

The rejection admits that *Lin et al.* provides no teachings for compensating for a temperature dependent gradient in a doped insulating film. To such a limitation the rejection relies on the following reasoning.

20

Barnes et al. teaches that dopant concentration is dependent from the reaction temperature (col. 6, lines 40-55, col. 7, lines 14-18).⁶

Applicants respectfully disagree. The portion of *Barnes et al.* relied upon is set forth below.

25

In particular, as the temperature increases the dielectric constant of the as-deposited layer decreases... As the fluorine (F) and/or carbon (C) concentration in the gas mixture increases, the F and/or C content of the as-deposited fluoro-organosilicate layer increases, decreasing its dielectric constant.⁷

⁶ The Office Action, dated 3/20/03, page 6, Lines 18-19.

⁷ *Barnes et al.*, Col. 6, Lines 42-50.

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The above excerpt does not teach that dopant concentration is dependent on reaction temperature. On the contrary, the above teaching of *Barnes et al.* shows a dielectric constant that varies according to reaction temperature or a dielectric constant that varies according to dopant content.

5 Accordingly, because the rejection relies on a teaching not shown in the cited reference, a *prim facie* case of obviousness cannot have been established for this claim.

Dependent claim 18 recites varying a supply rate for a first portion of the insulating film and maintaining a constant dopant supply rate for a second portion of the insulating film. To address the rejection of this claim, the comments set forth above for claim 9 are incorporated by
10 reference herein.

Dependent claim 19 recites that varying a dopant supply rate includes a closed loop control with temperature feedback. This limitation is not shown in the cited reference. It is clear that *Barnes et al.* not only does not show such limitations, but also teaches away from Applicants' claim limitations. The portion of *Barnes et al.* relied upon by the rejection is set
15 forth below.

A temperature sensor 172... to monitor the temperature... The measured temperature is used in a feedback loop to control the power supply 16 for the heating element 170, such that the wafer temperature can be maintained or
20 controlled at a desired temperature which is suitable for the particular process application.⁸

From the above it is clear that a temperature feedback is used to control temperature, not a dopant supply rate, as claimed. Further, such a feedback is used to maintain a temperature – thus
25 teaches directly away from the temperature gradient limitations of base claim 11.

Thus, the references not only do not show the limitations of claim 19, but also teach away from such limitations.

For this reason, the rejection of claim 19 is traversed.

⁸ *Barnes et al.*, Col. 3, Lines 16-23.

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The present claims 1-3, 5, 7-10, 11 and 13-19 are believed to be in allowable form. It is respectfully requested that the application be forwarded for allowance and issue.

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Respectfully Submitted,

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